

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING  
A FILING UNDER 35 U.S.C. 371**

2217/50147

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

**09/869094**INTERNATIONAL APPLICATION NO.  
PCT/AU99/01141INTERNATIONAL FILING DATE  
23 December 1999PRIORITY DATE CLAIMED  
23 December 1998

TITLE OF INVENTION

MEAT PRODUCT CASING HAVING A MAXIMUM EXTENSIBLE DIAMETER

APPLICANT(S) FOR DO/EO/US

Gervasio MERCURI

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (executed)
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Item 11. to 16. below concern other document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
  - a. Form PCT/IB/308; and
  - b. International Search Report



23911

PATENT TRADEMARK OFFICE

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <div style="font-size: 1.5em; font-weight: bold; margin-top: 5px;">09/869094</div>	INTERNATIONAL APPLICATION NO. PCT/AU99/01141	ATTORNEY'S DOCKET NUMBER 2217/50147																																														
17. [X] The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)):  Search Report has been prepared by the EPO or JPO ..... \$860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) ... \$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482)  but international search fee paid to USPTO 37 CFR 1.445(a)(2) ..... \$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor  international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$ 1000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482)  and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$100.00  <div style="text-align: right; font-weight: bold;">ENTER APPROPRIATE BASIC FEE AMOUNT = \$1000.00</div>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center; font-weight: bold;">CALCULATIONS</td> <td style="width: 50%; text-align: center; font-weight: bold;">FTO USE ONLY</td> </tr> </table>	CALCULATIONS	FTO USE ONLY																																												
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Surcharge of \$130.00 for furnishing the oath or declaration later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).  <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Claims</th> <th style="width: 25%;">Number Filed</th> <th style="width: 25%;">Number Extra</th> <th style="width: 25%;">Rate</th> </tr> </thead> <tbody> <tr> <td>Total Claims</td> <td>44 - 20 =</td> <td>24</td> <td>X \$18.00</td> </tr> <tr> <td>Independent Claims</td> <td>2 - 3 =</td> <td>0</td> <td>X \$80.00</td> </tr> <tr> <td colspan="3">Multiple dependent claim(s) (if applicable)</td> <td>+ \$270.00</td> </tr> <tr> <td colspan="3" style="text-align: right; font-weight: bold;">TOTAL OF ABOVE CALCULATIONS =</td> <td>\$1432.00</td> </tr> </tbody> </table>		Claims	Number Filed	Number Extra	Rate	Total Claims	44 - 20 =	24	X \$18.00	Independent Claims	2 - 3 =	0	X \$80.00	Multiple dependent claim(s) (if applicable)			+ \$270.00	TOTAL OF ABOVE CALCULATIONS =			\$1432.00	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Applicant claims Small Entity Status (See 37 CFR §1.27) [ ] yes [ ] no.</td> <td style="width: 50%;">\$</td> </tr> <tr> <td colspan="2">Reduction by 1/2 for filing by small entity, if applicable.</td> </tr> <tr> <td colspan="2" style="text-align: right; font-weight: bold;">SUBTOTAL =</td> </tr> <tr> <td colspan="2">\$1432.00</td> </tr> <tr> <td colspan="2">Processing fee of \$130.00 for furnishing the English translation later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).</td> </tr> <tr> <td colspan="2" style="text-align: right; font-weight: bold;">TOTAL NATIONAL FEE =</td> </tr> <tr> <td colspan="2">\$1432.00</td> </tr> <tr> <td colspan="2">Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28,3.31). \$40.00 per property +</td> </tr> <tr> <td colspan="2" style="text-align: right; font-weight: bold;">TOTAL FEE ENCLOSED =</td> </tr> <tr> <td colspan="2">\$1472.00</td> </tr> <tr> <td colspan="2">Amount to be:</td> </tr> <tr> <td colspan="2" style="text-align: right;">refunded</td> </tr> <tr> <td colspan="2" style="text-align: right;">charged \$</td> </tr> </table>	Applicant claims Small Entity Status (See 37 CFR §1.27) [ ] yes [ ] no.	\$	Reduction by 1/2 for filing by small entity, if applicable.		SUBTOTAL =		\$1432.00		Processing fee of \$130.00 for furnishing the English translation later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		TOTAL NATIONAL FEE =		\$1432.00		Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28,3.31). \$40.00 per property +		TOTAL FEE ENCLOSED =		\$1472.00		Amount to be:		refunded		charged \$	
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a. [ X ] Two checks in the amount of \$1432.00 for the filing fee and \$40.00 for the assignment recordation fee are enclosed. b. [ ] Please charge my Deposit Account No. _____ in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. [ X ] The Commissioner is hereby authorized to charge any additional fees, which may be required, or credit any overpayment to Deposit Account No. <u>05-1323</u> . A duplicate copy of this sheet is enclosed.  NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.  SEND ALL CORRESPONDENCE TO: Crowell & Moring, L.L.P., P.O. Box 14300 Washington, D.C. 20044-4300 Tel. No. (202) 628-8800 Fax No. (202) 628-8844																																																
JDS:pct		<div style="text-align: center;"> <div style="border-top: 1px solid black; width: 100%; margin-top: 5px;"></div>         SIGNATURE          Jeffrey D. Sanok  <div style="border-top: 1px solid black; width: 100%; margin-top: 5px;"></div>         NAME          32,169  <div style="border-top: 1px solid black; width: 100%; margin-top: 5px;"></div>         REGISTRATION NUMBER          June 25, 2001  <div style="border-top: 1px solid black; width: 100%; margin-top: 5px;"></div>         DATE       </div>																																														

Attorney Docket: 2217/50147  
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: GERVASIO MERCURI

Serial No.: NOT YET ASSIGNED PCT NO.: PCT/AU99/01141

Filed: JUNE 25, 2001

Title: MEAT PRODUCT CASING HAVING A MAXIMUM EXTENSIBLE  
DIAMETER

PRELIMINARY AMENDMENT

Box PCT

Commissioner for Patents  
Washington, D.C. 20231

Sir:

Please enter the following amendments to the specification,  
claims and abstract prior to the examination of the application.

IN THE SPECIFICATION:

Please amend the specification as follows:

Page 1, after the title, insert the following heading:

--BACKGROUND AND SUMMARY OF THE INVENTION--.

Page 5, between lines 2 and 3, insert the following  
heading:

--BRIEF DESCRIPTION OF THE DRAWINGS--; and

between lines 13 and 14, insert the following  
heading:

--DETAILED DESCRIPTION OF THE DRAWINGS--.

IN THE CLAIMS:

Please amend claims 9, 13, 14, 17, 18 and 19 as follows:

(A copy of the marked-up version of amended claims 9, 13, 14, 17, 18 and 19 are attached to this Preliminary Amendment).

9. (Amended) A tubular casing according to claim 7 further comprising a tubular fibrous casing located within and co-extensive with said net-like tube, said fibrous casing comprising an inner liner for said net-like tube.

13. (Amended) A tubular casing according to claim 11 wherein the diameter of said net-like tube where said elastic threads become taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.

14. (Amended) A tubular casing according to claim 9 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

17. (Amended) A tubular casing according to claim 15 wherein said circumferential thread is secured to said knitted tube such that it forms a continuous spiral along the length of said knitted tube, said longitudinal threads comprise

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interlocking loop stitches, each said loop stitch extending between said circumferential threads.

18. (Amended) A tubular casing according to claim 15 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

19. (Amended) A tubular casing according to claim 15 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

Please add new claims 21-44 as follows:

--21. A tubular casing according to claim 8 further comprising a tubular fibrous casing located within and co-extensive with said net-like tube, said fibrous casing comprising an inner liner for said net-like tube.

22. A tubular casing according to claim 21 wherein said circumferential elastic threads become taut at a diameter which is substantially equal to the diameter of said fibrous casing when it is filled.

23. A tubular casing according to claim 22 wherein the diameter of said fibrous casing is greater than the diameter of said net-like tube so that said circumferential elastic threads apply compressive force to said fibrous casing as it is being filled.

24. A tubular casing according to claim 23 wherein the diameter of said fibrous casing is between 2 and 4 times greater than the diameter of said net-like tube.

25. A tubular casing according to claim 23 wherein the diameter of said net-like tube where said elastic threads become taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.

26. A tubular casing according to claim 12 wherein the diameter of said net-like tube where said elastic threads become taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.

27. A tubular casing according to claim 24 wherein the diameter of said net-like tube where said elastic threads become

taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.

28. A tubular casing according to claim 10 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

29. A tubular casing according to claim 11 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

30. A tubular casing according to claim 12 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

31. A tubular casing according to claim 13 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

32. A tubular casing according to claim 21 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

33. A tubular casing according to claim 22 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

34. A tubular casing according to claim 23 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

35. A tubular casing according to claim 24 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

36. A tubular casing according to claim 25 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.

37. A tubular casing according to claim 16 wherein said circumferential thread is secured to said knitted tube such that it forms a continuous spiral along the length of said knitted tube, said longitudinal threads comprise interlocking loop stitches, each said loop stitch extending between said circumferential threads.



38. A tubular casing according to claim 16 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

39. A tubular casing according to claim 17 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

40. A tubular casing according to claim 37 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

41. A tubular casing according to claim 16 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

42. A tubular casing according to claim 17 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

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43. A tubular casing according to claim 18 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

44. A tubular casing according to claim 37 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.--

IN THE ABSTRACT:

Please add an Abstract of the Disclosure submitted herewith on a separate page.

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REMARKS

Entry of the amendments to the specification, claims and abstract before examination of the application is respectfully requested.

If there are any questions regarding this Preliminary Amendment or this application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

It is respectfully requested that, if necessary to effect a timely response, this paper be considered as a Petition for an Extension of Time sufficient to effect a timely response and shortages in other fees, be charged, or any overpayment in fees be credited, to the Account of Crowell & Moring, L.L.P., Deposit Account No. 05-1323 (Docket #2217/50147).

Respectfully submitted,

June 25, 2001

  
Jeffrey D. Sanok  
Registration No. 32,169

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JDS:pct

--ABSTRACT OF THE DISCLOSURE

A tubular casing for use with food products which includes knitted stockinette, longitudinal threads and circumferential spiral threads that are held to stockinette by stitches located along the length of the casing. Each thread comprises an elastic thread formed from an inextensible yarn spirally wrapped around the outside of a rubber thread. As thread is stretched, the rubber thread extends and the helix angle of the spirally wrapped yarn reduces to the point where the yarn approximates a straight line. Th inextensible yarn resists further stretching beyond this point. This point is the elastic limit for thread and it can be adjusted by varying the helix angle during manufacture of the elastic thread. Threads therefore allow the casing to be filled to a predetermined maximum diameter and result in the filled casing having a constant diameter throughout its length.--

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend claims 9, 13, 14, 17, 18 and 19 as follows:

9. (Amended) A tubular casing according to [either] claim 7 [or 8] further comprising a tubular fibrous casing located within and co-extensive with said net-like tube, said fibrous casing comprising an inner liner for said net-like tube.

13. (Amended) A tubular casing according to [either] claim 11 [or 12] wherein the diameter of said net-like tube where said elastic threads become taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.

14. (Amended) A tubular casing according to [any one of claims] claim 9 [to 13] wherein said fibrous casing is folded flat with at [lest] least one pleat so that its width is reduced to fit within said net-like tube.

17. (Amended) A tubular casing according to claim 15 [or claim 16] wherein said circumferential thread is secured to said knitted tube such that it forms a continuous spiral along the length of said knitted tube, said longitudinal threads comprise interlocking loop stitches, each said loop stitch extending between said circumferential threads.

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18. (Amended) A tubular casing according to [any one of claims 15 to 17] claim 15 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

19. (Amended) A tubular casing according to [any one of claims 15 to 18] claim 15 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

MEAT PRODUCT CASING HAVING A MAXIMUM EXTENSIBLE DIAMETER

This invention relates to a tubular product such as a tubular casing, and in particular to a tubular casing having a predetermined maximum extensible diameter.

The main application for tubular products such as tubular casing of the variety described in this specification is in the food industry. However, the invention is not restricted to this particular application. Tubular products such as knitted netting or elasticated knitted fabric casing are used in the cooking and curing process of meat products. In the cooking of certain meat products, it is common to pack the meat pieces into an elasticated tubular net. The tubular net compresses the meat pieces and holds them together during the cooking process.

Such tubular products are normally removed from cooked meat products which can then be further packaged, ready for sale. Elasticated tubular casing is also used on cured meat products such as ham and metwurst.

The means of filling tubular casing normally comprises fitting the casing onto a hollow cylindrical mandrill, which is known as a stuffing tube, and using a machine to pump or force meat product under pressure through the stuffing tube into the casing. The casing is drawn from the stuffing tube as the meat product is extruded out of the stuffing tube. The process is started by first clipping the end of a casing once sufficient casing is placed on the stuffing tube. Further clips are placed at intervals dependent on the required length of the product.

Such machines can be used either with minced meat products, meat portions or whole meat muscle.

It is difficult to maintain a constant diameter of the resultant product as the casing is being filled. Tubular product that is commonly used such as tubular netting is able to expand to very large diameters. The required diameter is normally

achieved by controlling the pressure at which meat product is pumped through the stuffing tube. However, it is still possible to produce a filled casing that varies considerably in diameter. This is quite undesirable as many of the compressed meat products are normally sliced at the time of purchase. Therefore, it is desirable to ensure a constant diameter and to also not exceed certain diameters which would be unsuitable for some slicing machines. Clearly, a product of uniform diameter is more visually appealing and avoids wastage and reworking of product at the manufacturing stage.

Accordingly, it is an aim of the invention to provide a tubular casing which resists expansion beyond a required or preset diameter.

In its broadest form, the invention is a tubular casing for use with food product that includes,

circumferential threads along the length of said tubular casing that become taut at a preset diameter so that said tubular casing has a predetermined diameter when filled with food products.

Preferably, the circumferential threads may comprise either elasticated threads or inextensible threads.

In the case of inextensible threads, the threads may be incorporated into either a net or netted stockinette so that, at a relaxed diameter, the circumferential threads lie loosely on the surface of the net or stockinette. However, at the preset filled diameter of the casing, the threads become taut and prevent further expansion of the net or stockinette. In the case of elastic circumferential threads, the elastic threads are provided with an elastic limit where, below the elastic limit the threads remain extensible, and that at the elastic limit, the threads become inextensible.

Elasticated thread is normally a combination of rubber thread or strips with natural or synthetic yarns wrapped around the length of the rubber. A large number



of turns of yarn per centimetre of rubber is normally used to cover the rubber surface. Elasticated threads formed in this way have more than adequate extensibility. In fact, the elasticated threads remain extensible well beyond the desired maximum diameter of the product being produced which allows bulging to readily occur.

In a further aspect of this invention, elastic thread is provided with an elastic limit by controlling the rate at which yarn is wrapped onto the external surface of the rubber thread. It has been found that the elastic limit can be set by controlling the number of turns of yarn per centimetre of elastic thread.

The yarn forms a helix or spiral around and along the length of the rubber thread. As the elastic thread is stretched, the helix or spiral expands so that the helix angle increases thereby enabling stretching of the rubber. At the same time, the diameter of the helix or spiral reduces. If the number of turns of yarn per centimetre on the elastic thread is limited, then the lengthwise expansion of the helix and its continual reduction in diameter will result in a limit being reached whereby further tensile force applied to the elastic thread is resisted by the yarn. This occurs when the yarn helix affectively approximates a straight piece of thread where stretching force results in only tensile force within the yarn.

Although the yarn wrapped around the rubber thread does not completely straighten, it will reach a point where the helix is unable to straighten any further, and therefore approximates a straight length of thread.

Once the tensile force is resisted by the yarn, the elastic thread will not be able to stretch. The elastic thread is then effectively inextensible. That is, further force applied to thread will not result in any additional stretch or extension.

The elastic limit is determined by the number of turns of yarn per centimetre around the rubber thread. The limit can therefore be predetermined, and as such

tubular casing using elasticated thread can be produced which will have a maximum diameter to which it can expand.

A typical method for manufacturing tubular casing is by circular knitting machines. Typical casings are single knit jersey tubes which may incorporate circumferential and longitudinal threads. The circumferential threads normally comprise a single thread that forms a spiral that extends along the length of the tubular casing.

In addition, circular knitting machines may be used to produce tubular netting which comprises longitudinal and circumferential thread members. Again, the circumferential thread forms a continuous spiral along the length of the tubular casing. The longitudinal stitches are spaced at regular intervals around the circumference of the casing.

Accordingly, the invention may be utilised in respect of stockinette casings incorporating inextensible or elastic threads as circumferential members. Also, the invention may be used with net casing products where either inextensible or elastic threads according to the invention are used.

In addition, the invention may also be a tubular casing which is a combination of a net and fibrous casings. The fibrous casing is located within and extends along the length of the net casing. Preferably, the diameter of the fibrous casing greatly exceeds the diameter of the net casing in its relaxed form. This ensures, in the case of a net having elastic circumferential threads, that a constant compressive force is applied to meat product as it is forced into the tubular casing.

Preferably, the stuffing process results in embedding of circumferential and longitudinal threads into the surface of the meat product once the maximum diameter is reached. This will serve to produce a pattern on the surface of the meat product once the casing is removed. In the case of a combination of net and fibrous

casing, the maximum diameter of the net is slightly less than the maximum diameter of the fibrous casing to ensure formation of the pattern effect.

In order to fully understand the invention, preferred embodiments will now be described. However, it should be realised that the invention is not confined or restricted to the precise combination of elements shown in these embodiments. These embodiments are illustrated in the following drawings in which:

Figure 1 shows an elastic thread prior to stretching,

Figure 2 shows a stretched elastic thread at its elastic limit,

Figure 3 shows a tubular casing comprising a knitted stockinette in combination with circumferential and longitudinal members,

Figure 4 shows a tubular casing according to Figure 3 in its filled form, and

Figure 5 shows a tubular casing comprising a combination of a net and fibrous casing.

Figures 1 and 2 represent schematically the elastic thread 10. It is shown in Figure 1 in its relaxed form and in Figure 2 at the elastic limit of stretchability. The elastic thread 10 comprises a rubber thread 11 which has yarn 12 wrapped around its external surface in a spiral or helix.

The dimension X shown in Figure 1 is the distance between the turns of yarn 12 along the length of the rubber thread 11. As the elastic thread 10 is stretched, the dimension X increases. The same time, the diameter of the rubber thread 11 reduces.

The helix angle of the yarn 12 increases until it reaches a point shown in Figure 2 where further stretching force is resisted as a pure tensile load within the yarn 12. This results from the helix angle being so small that the compressive force applied to the rubber thread 11 reduces to such a point that it is easily resisted by the rubber thread 11. At this point, the yarn 12 approximates a straight line as all of the further stretching force is resisted by the yarn 12. Accordingly, the yarn 12 which is

substantially inextensible resists any further stretching even though the rubber thread 11 may not be at its elastic limit.

At this point, the elastic thread 10 has reached an elastic limit and becomes effectively inextensible. The point at which this elastic limit is reached, is dependent on the number of turns of yarn 12 for any given interval. The degree of extension can be determined by easy experimentation. For example, a single strand of rubber thread 11 having a 1 mm diameter and approximately 9 turns of yarn 12 per centimetre that is knit into a tubular net having a relaxed diameter of approximately 12 centimetres, will allow the net to expand to a maximum diameter of approximately 20 centimetres. In this example, the net is able to expand an additional 8 centimetres before reaching its maximum diameter. This enables the elasticated net to be pulled onto a stuffing tube which has a diameter of 17 centimetres. It will result in a meat product having a maximum diameter of 20 centimetres and bulging will be resisted beyond this diameter due to reaching the elastic limit of the circumferential elastic threads.

A tubular net or tubular casing using circumferential elastic threads 10 will continue to apply considerable compressive force to meat product within once it reaches its maximum diameter. This compressive force will be maintained even though there may be some further shrinkage of the meat product.

The elastic limit of the elastic thread 10 can be produced in a number of ways. As described above, it is common to wrap yarn 12 in a helix around rubber thread 11. However, other wrapping patterns may be used such as multiple yarns 12 wrapped in different directions, or the use of a rubber material which may itself exhibit inextensibility at a given limit of stretch.

Figures 3 and 4 show a tubular casing comprising longitudinal threads 13 and a circumferential spiral thread, referred to herein as a circumferential thread 16, in combination with a knitted tubular stockinette 15. The circumferential threads 16 are

held to the tubular stockinette 15 via tuck stitches 17 and the longitudinal threads 13 comprise knitted loop stitches where a single loop extends from each circumferential thread 16 to loop around the corresponding loop stitch of a lower circumferential thread 16.

The circumferential threads 16 comprises an elastic thread 10 having an elastic limit of stretch. Once the tubular casing shown in Figure 3 reaches the maximum diameter of the circumferential threads 16, the tubular stockinette 15 remains stretchable, which allows some further expansion within the area bounded by the circumferential and longitudinal threads 16 and 13. This results in a quilted surface pattern which is illustrated in Figure 4.

The tubular stockinette 15 remains substantially impermeable to meat product that is placed within the tubular casing. This remains the case even though the meat product may be finely minced. Compression applied by the circumferential threads 16 compresses the fibres of the meat product at the surface which tends to seal the surface against any moisture loss. This has a significant advantage in respect of maintaining weight during the cooking or curing process.

As an alternative, the circumferential threads 16 of the embodiment shown in Figure 3 may comprise inextensible threads which are held to the surface of the tubular stockinette 15 via the tuck stitches 17. These circumferential threads 16 will lie loosely across the surface of the tubular stockinette 15 prior to filling. However, these circumferential threads 16 will limit expansion of the tubular casing to a set diameter and accordingly the expansion of the tubular stockinette 15 will be limited. At this point, some further expansion of the stockinette may occur depending on the pumping pressure of meat product being inserted within the tubular casing. This can result in further expansion of the tubular stockinette 15 with both the longitudinal and circumferential threads 13 and 16 being embedded into the surface of the meat product to again produce a quilted surface pattern shown in Figure 4.

The tubular casing illustrated in Figure 3 and 4 can be continuously produced in a circular knitting machine both for the version using the elastic thread 10 or an inextensible thread. This knitting process results in both the longitudinal and circumferential threads 13 and 16 being located on the external surface of the tubular stockinette 15.

Figure 5 shows a further embodiment of the invention in which the tubular casing is a combination of a tubular net 19 in combination with a tubular fibrous casing 20. The tubular net comprises a circumferential thread 21 which is a single thread forming spiral along the length of the tubular net 19 and longitudinal threads 22 which each comprise a number of loop stitches to form a continuous longitudinal thread 22.

In this embodiment, the circumferential threads 21 comprise elastic threads 10 having an elastic limit of stretch.

The fibrous casing 20 has an unfilled diameter which exceeds that of the relaxed tubular net 19 by a factor of between 2 and 4. In order to locate the fibrous casing 20 within the tubular net 19, is it folded or pleated as shown in Figure 5. This ensures that, as the fibrous casing 20 is being filled, the circumferential threads 21 apply a compressive force throughout the filling process.

In this embodiment, the diameter of the fibrous casing 20 is matched to the diameter at which the circumferential threads reach their elastic limit. In this embodiment, the maximum diameter of the tubular net 19 is slightly smaller than the maximum diameter of the fibrous casing 20. This results in a slight embedding of both the circumferential and longitudinal threads 21 and 22 within the surface of the fibrous casing 20. This produces the quilted pattern effect similar to that shown in Figure 4.

In addition to creating a tubular casing having a predetermined diameter, it would also be possible to produce a controlled variation of diameter along the length of the casing. This is possible in respect of any of the embodiments described above that use the elastic thread 10. In order to achieve this, the rate at which the yarn 12 is wrapped around the elastic threads 11 can be varied so that the elastic limit of the elastic thread 10 also varies. This variation can be produced in a controlled manner so that the maximum diameter of the tubular casing varies along its length.

This process would enable a variety of shapes to be produced. For example, alternating large and small diameter sections are possible along the length of the tubular casing. Even spherical or elliptical shapes are possible so that a traditional shape used for certain meat products such as parma ham can also be produced.

It will be seen from the above description, that the invention will be extremely useful, and will provide a tubular casing which itself can control the maximum diameter of the meat product inserted within.

## THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A tubular casing for use with food products including:  
circumferential threads along the length of said tubular casing that become taut at a preset diameter so that said tubular casing has a predetermined diameter when filled with food products.
2. A tubular casing according to claim 1 wherein said circumferential threads comprise elastic threads having a predetermined elastic limit so that below said elastic limit, said threads are elastically extensible and that at said elastic limit said threads become inextensible.
3. A tubular casing according to claim 1 wherein said circumferential threads comprise inextensible threads that are attached to said tubular member so that said threads become taut at a predetermined diameter.
4. A tubular casing according to claim 3 wherein said tubular member comprises a knitted tube with said inextensible threads attached to said knitted tube.
5. A tubular casing according to claim 4 wherein said knitted tube further comprises a circumferential elastic thread extending along the length of said knitted tube.
6. A tubular casing according to claim 1 wherein said tubular casing is a net-like tube comprising spaced circumferential and longitudinal threads.
7. A tubular casing according to claim 6 wherein said circumferential thread comprises an elastic thread having a predetermined elastic limit so that below said elastic limit, said threads are elastically extensible and that at said elastic limit said threads become inextensible.



8. A tubular casing according to claim 7 wherein said elastic thread comprises a single continuous thread that forms a spiral along the length of said tubular casing.
9. A tubular casing according to either claim 7 or 8 further comprising a tubular fibrous casing located within and co-extensive with said net-like tube, said fibrous casing comprising an inner liner for said net-like tube.
10. A tubular casing according to claim 9 wherein said circumferential elastic threads become taut at a diameter which is substantially equal to the diameter of said fibrous casing when it is filled.
11. A tubular casing according to claim 10 wherein the diameter of said fibrous casing is greater than the diameter of said net-like tube so that said circumferential elastic threads apply compressive force to said fibrous casing as it is being filled.
12. A tubular casing according to claim 11 wherein the diameter of said fibrous casing is between 2 and 4 times greater than the diameter of said net-like tube.
13. A tubular casing according to either claim 11 or 12 wherein the diameter of said net-like tube where said elastic threads become taut is smaller than the maximum diameter of said fibrous casing so that said circumferential and longitudinal threads press inwardly against said fibrous casing.
14. A tubular casing according to any one of claims 9 to 13 wherein said fibrous casing is folded flat with at least one pleat so that its width is reduced to fit within said net-like tube.
15. A tubular casing according to claim 1 wherein said tubular casing comprises a knitted tube that is stretchable and substantially impermeable to said food products and circumferential and longitudinal threads secured to and spaced, respectively, along and around said knitted tube, said knitted tube still being stretchable when

said circumferential threads become taut so that said circumferential and longitudinal threads press into the surface of said food product so that a quilted-like surface pattern is applied to the surface of said food product.

16. A tubular casing according to claim 15 wherein said circumferential and longitudinal threads are secured to said first tubular portion as it is being knitted.

17. A tubular casing according to claim 15 or claim 16 wherein said circumferential thread is secured to said knitted tube such that it forms a continuous spiral along the length of said knitted tube, said longitudinal threads comprise interlocking loop stitches, each said loop stitch extending between said circumferential threads.

18. A tubular casing according to any one of claims 15 to 17 wherein said circumferential and longitudinal threads are secured to the outside surface of said knitted tube.

19. A tubular casing according to any one of claims 15 to 18 wherein the circumferential thread comprises an elastic thread having a predetermined elastic limit, said circumferential threads are elastically extensible and that at said elastic limit said threads become inextensible.

20. An elastic thread for a tubular casing that is used with food products that has a predetermined elastic limit above which said elastic thread becomes taut and inextensible, comprising:

a rubber thread or a plurality of rubber threads, and

a yarn wrapped along the length of said rubber thread or threads, the number of wraps of yarn along said rubber thread or threads limited so that said elastic thread becomes taut after a predetermined amount of stretch.

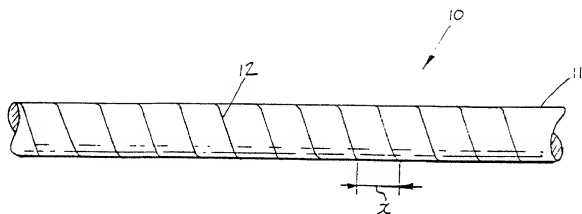


FIG 1

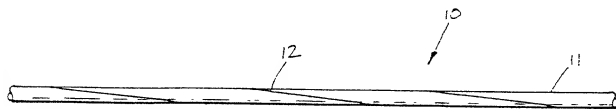
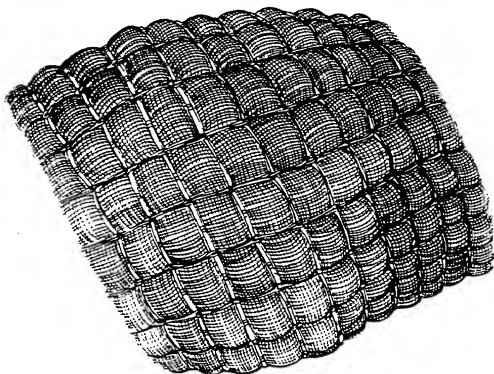
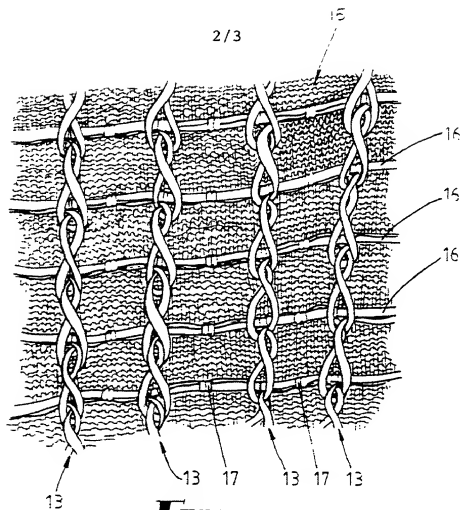
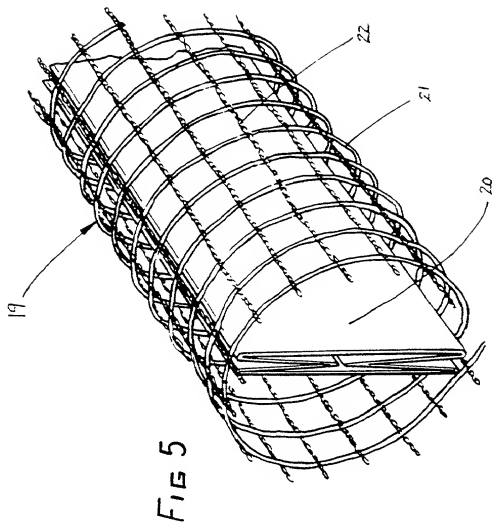


FIG 2





COMBINED SUPPLEMENTAL DECLARATION FOR PATENT APPLICATION  
AND POWER OF ATTORNEY  
(includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

2217/50147

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**MEAT PRODUCT CASING HAVING A MAXIMUM EXTENSIBLE DIAMETER**

the specification of which (check only one item below):

☐ is attached hereto

☐ was filed as United States application

Serial No. \_\_\_\_\_  
on \_\_\_\_\_  
and was amended  
on \_\_\_\_\_ (if applicable).

☒ was filed as PCT international application

Number PCT/AU99/01141  
on 23 December 1999  
and was amended under PCT Article 19  
on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119.

COUNTRY (if PCT indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
Australia ✓	PP 7901 ✓	23 December 1998 ✓	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
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